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ABSTRACT

The Enright Arithmetic Program is a diagnostic-prescriptive program designed to facilitate an effective remedial effort. This paper evaluates the effect of the use of the program on the performance of students needing remedial education in mathematics. The program begins by establishing for each student the exact set of skills that the student currently needs to learn and also identifies the exact error pattern causing the student's current failure. Practice materials cross-referenced to the precise skill the student needs to learn are provided. In addition, the program indicates strategies designed to remediate the student's specific error pattern. The results measured by a city-wide mathematics test and a criterion-referenced test showed the positive effect of the program on the rate of skill acquisition of students in an intermediate school (grades 5 through 8). (YP)

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A Research Report

on the

ENRIGHT ARITHMETIC PROGRAM

Use in an

Urban Intermediate School

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Background

The Enright Arithmetic Program is a diagnostic-prescriptive program designed to facilitate an effective remedial effort. The basic philosophy of the program is that for effective remediation to take place, there must be first a clear understanding of the nature of the difficulty each student is experiencing. The program therefore begins by establishing for each student the exact set of skills that student currently needs to learn and also identifies the exact error pattern causing the student's current failure.

The Enright Arithmetic Program then goes on to provide significant practice materials cross-referenced to the precise skill the student needs to learn. In addition, the program provides the teacher with strategies designed to remediate the student's specific error pattern.

This program was extensively field-tested before it's introduction to this urban school district. However, it was believed that a pilot of the program in a large urban area would be helpful in ascertaining the program's utility within an urban setting. A report of the original field-testing is available upon request from the research department of Curriculum Associates.

The Pilot School

A decision was made to evaluate the effectiveness of this program in an intermediate school in an urban New England area. This school serves approximately 500 students in grades 5 through 8. The city-wide testing for the school year of 83 - 84 indicated that 16.3% of that school's population was on grade level.

Inservice

Mary Connolly, Senior Consultant for Curriculum Associates, conducted the initial inservice training. In addition, because of the fact that this was a pilot school, she made periodic visits to this intermediate school to assist the staff in implementing the program.

The Study

The central question to be answered by the pilot was, "What is the effect of the use of the Enright Arithmetic Program on the performance of students needing remedial education in mathematics?".

Two separate measures were used in order to determine the answer to this question. First, the scores from the city-wide test in mathematics were used as a pre-post measure of student growth. Second, the criterion-referenced measure contained within the program was used as a measure of effect on curriculum growth.

Results

The first aspect of the study was to examine the effect of the program on students gaining greater than one year in math. As is indicated in Table 1, 61% (when rounding off to the nearest year) of the students made greater than 1 year gain in both computation and total mathematics on the City-Wide Mathematics Test. On the criterion referenced measure of student growth, 82% made over 1 year gain in computation. The greater gain on the criterion referenced measure might be explained by nature of a norm referenced test, where items that measured very low level skills would not be included with the same weight as skills nearer the level being tested.

Table 1: Reported Gain Scores for Grades 5 - 8.

	Computation	Total Math	Curriculum Level
< 1	157	154	75
> 1	245	242	338
% > 1	61%	61%	82%

* Scores are rounded to nearest year.

Table 2 provides a breakdown of grades 6, 7 & 8, as well as a view of the total effect of the program with regard to growth measured by a criterion-referenced measure of gain scores in curriculum.

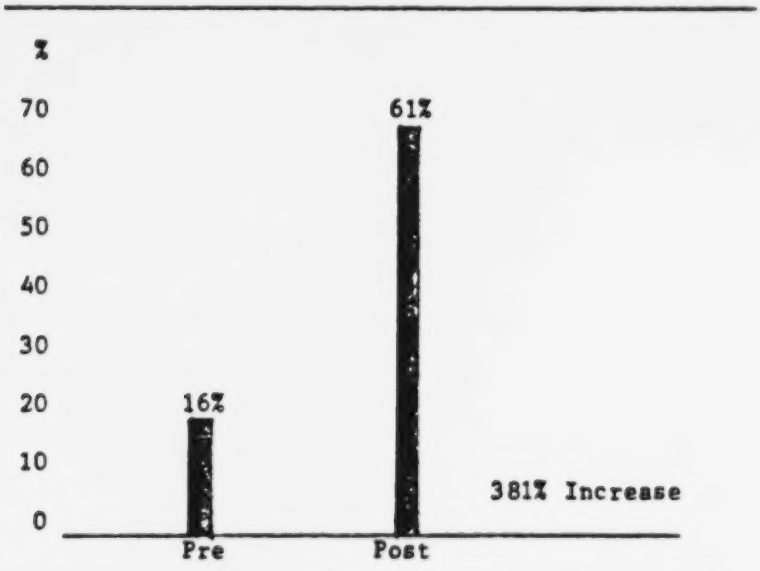
Table 2: Curriculum Gains per Grade & Total

	6th	7th	8th	Total
<1	23	25	49	120
>1	106	111	49	293
% >1	82%	82%	50%	71%

* Results not rounded to nearest year.

Table 3 demonstrates the comparison of the pre and post measures of total math performance on the City-Wide Mathematics Test. The Pre measure was estimated by assuming that a student on grade level had in fact made 1 year measured growth for each year in school. Students repetition of grades was not counted in as a factor. Therefore with 16.3% of students on grade level, it is reasonable to estimate that that same % of students made 1 year gain for each year in school on the average. The results in this comparison are therefore significant.

Table 3: Comparison of Pre-Post % of Students Making a 1 Year or Better Gain in Total Math Scores.



* figures rounded to the nearest %.

Consideration of the impact the program had on students who were more than 1 year below grade level in computation was also evaluated. Tables 4 & 5 provide data regarding 7th and 8th grade students who were more than 1 year, 2 years, and 3 years below grade level in computation at the beginning of this study. The reason this data is of particular interest is the realization that these grades are often the last chance for these students to be provided any remedial program. Therefore, the program is helpful if it can have an impact on the students who genuinely need it. The results in Tables 4 & 5 do demonstrate that for students who are significantly behind the program is very helpful.

Table 4: Analysis of Gain Scores in Computation by Initial Deficit for 7th Graders.

	<1	>1	>2	>3	Tot >1
-3 Yr	5	8	5	3	16
-2 Yr	18	6	6	2	14
-1 Yr	10	6	3	2	11
	33				41 = 55%

Table 5: Analysis of Gain Scores in Computation by Initial Deficit of 8th Graders.

	<1	>1	>2	>3	Tot >1
-3 Yr	14	19	9	4	32
-2 Yr	10	1	3	4	8
-1 Yr	7	4	4	0	8
	31				48 = 61%

Lastly, an analysis was made of the percent of students on grade level for the pre measure and the post measure. Table 6 provides the results of that analysis. The striking factor of this table is the percentage of students reaching grade equivalence on the post measure as compared to the pre measure.

Table 6: Comparison of % of Students on Grade Level in Total Math as Measured by the City-Wide Mathematics Test.

1984	1985	% Increase
16 %	27.5 %	72 %

Summary

It is clear that the addition of the Enright Arithmetic Program did have a positive effect on the rate of skill acquisition of students in this intermediate school. Data was not available at the time of this report to compare the rate of increase in percentage of students on grade level at the pilot school and all other intermediate schools in this city. This would be useful data to decision makers in other districts. The rate of increase was compared to the other intermediate schools in the same district and the pilot intermediate school had the greatest positive percentage of change.